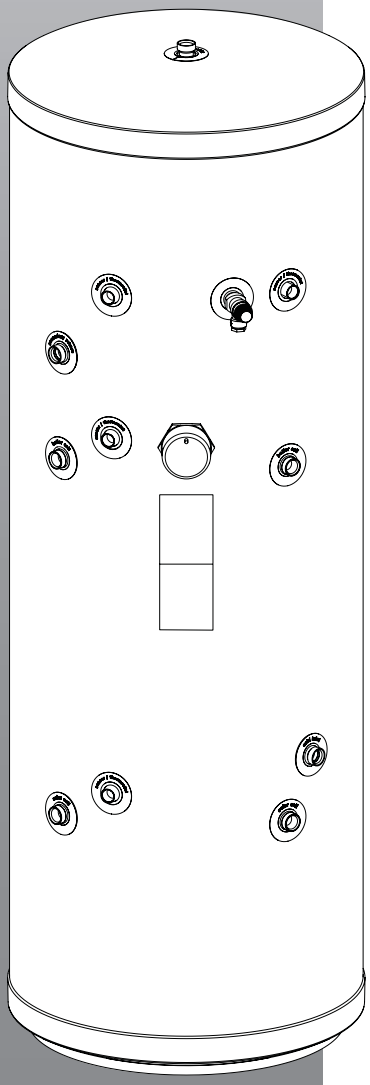
INSTALLATION AND MAINTENANCE INSTRUCTIONS

TWIN COIL INDIRECT UNVENTED HOT WATER CYLINDER

GREENSTORE TC CYLINDER SERIES

150/180/210/250/300 LITRE



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THE MARK OF QUALITY FOR THE INSTALLATION, COMMISSIONING AND SERVICING OF DOMESTIC HEATING AND HOT WATER SYSTEMS

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CONTENTS

1 Key to symbols and safety precautions 3
1.1 Explanation of symbols 3
1.2 Safety instructions 3

2 Product details 4
2.1 Usage 4
2.2 Intended use 4
2.3 Equipment level 4
2.4 Standard delivery 5
2.5 Scaling/Corrosion protection 5
2.6 Description of function 5
2.7 Physical and connection dimensions 6
2.8 Specification 8

3 Installation 10
3.1 Regulations 10
3.2 Handling 10
3.3 Installation location 10
3.4 Solar connection diagram 11
3.5 Installing the temperature sensors 12
3.6 Installation 13
3.7 Electrical connections 16

4 Commissioning 19
4.1 User information from the system installer 19
4.2 Preparing for use 19
4.3 Setting the cylinder temperature 19

5 Shutting down 19
5.1 Taking the cylinder out of use 19

6 Environmental protection/disposal 20

7 Inspection/Maintenance 20
7.1 Recommendations for users 20
7.2 Maintenance and repair 20

8 Spare parts list 20

9 The Guarantee 20

1 KEY TO SYMBOLS AND SAFETY PRECAUTIONS

1.1 EXPLANATION OF SYMBOLS

WARNING SYMBOLS

Safety instructions in this document are framed and identified by a warning triangle which is printed on a grey background.

Electrical hazards are identified by a lightning symbol surrounded by a warning triangle.

Signal words indicate the seriousness of the hazard in terms of the consequences of not following the safety instructions.

- **NOTICE** indicates possible damage to property or equipment, but where there is no risk of injury.
- **CAUTION** indicates possible injury.
- **WARNING** indicates possible severe injury.
- **DANGER** indicates possible risk to life.

IMPORTANT INFORMATION

Notes contain important information in cases where there is no risk of personal injury or material losses and are identified by the symbol shown on the left. They are bordered by horizontal lines above and below the text.

ADDITIONAL SYMBOLS

Symbol	Meaning
▶	a step in an action sequence
→	a reference to a related part in the document or to other related documents
•	a list entry
–	a list entry (second level)

Table 1

benchmark
COLLECTIVE MARK
THE MARK OF QUALITY FOR THE INSTALLATION, COMMISSIONING AND SERVICING OF DOMESTIC HEATING AND HOT WATER SYSTEMS

Benchmark places responsibilities on both manufacturers and installers. The purpose is to ensure that customers are provided with the correct equipment for their needs, that it is installed, commissioned and serviced in accordance with the manufacturer's instructions by competent persons and that it meets the requirements of the appropriate Building Regulations. The Benchmark Checklist can be used to demonstrate compliance with Building Regulations and should be provided to the customer for future reference.

Installers are required to carry out installation, commissioning and servicing work in accordance with the Benchmark Code of Practice which is available from the Heating and Hotwater Industry Council who manage and promote the scheme.
Visit **centralheating.co.uk** for more information.

1.2 SAFETY INSTRUCTIONS

POSITIONING AND CONVERSION

- ▶ Only competent installers must install, commission, and maintain this equipment.
- ▶ Only use the cylinder for heating domestic hot water.

FUNCTION

- ▶ Observe these installation and maintenance instructions to ensure correct operation.
- ▶ Never switch the electric immersion heater on if the cylinder is not full of water.
- ▶ **Never restrict the outlets of the safety valves.**

THERMAL DISINFECTION

- ▶ **Risk of scalding!**
  Caution should be taken at periods of thermal disinfection due to the possibility of domestic hot water temperatures being in excess of 60 °C .

MAINTENANCE

- ▶ **Recommendation for the customer:** Arrange a maintenance and inspection contract with a competent person. Have the heating appliance and the DHW cylinder serviced annually.
- ▶ Always switch the mains off when servicing the system.
- ▶ Only use genuine spare parts.

2 PRODUCT DETAILS

2.1 USAGE

These cylinders are designed to accept input from two heat sources, the most common being a solar input supported by a controlled appliance such as a gas or oil boiler. The maximum cylinder heat input must not exceed the following values:

Cylinder	Max. cylinder heat input
TC-150	31.9 kW
TC-180	
TC-210	39.4 kW
TC-250	
TC-300	

Table 2

Where the combined heat input exceeds the maximum input stated, precautions must be taken to limit the heating appliances to the appropriate input (see installation instructions of the heating appliance).

Correctly commissioned input reduces the cycling of the heating appliance and reduces the cylinder heat-up time.

2.2 INTENDED USE

► Only use the cylinder for heating domestic hot water.

Any other application will be considered incorrect use. No liability for any losses resulting from such use is accepted.

2.3 EQUIPMENT LEVEL

- 4x sensor pockets internal Ø = 20.4 mm
- Upper indirect coil for heating by the secondary heating appliance
- Lower indirect coil for heating using the primary heat source, including solar input.
- All-round rigid insulation, free of CFC and HCFC.
- Duplex stainless steel cylinder
- Immersion heater, 3 kW

2.4 STANDARD DELIVERY

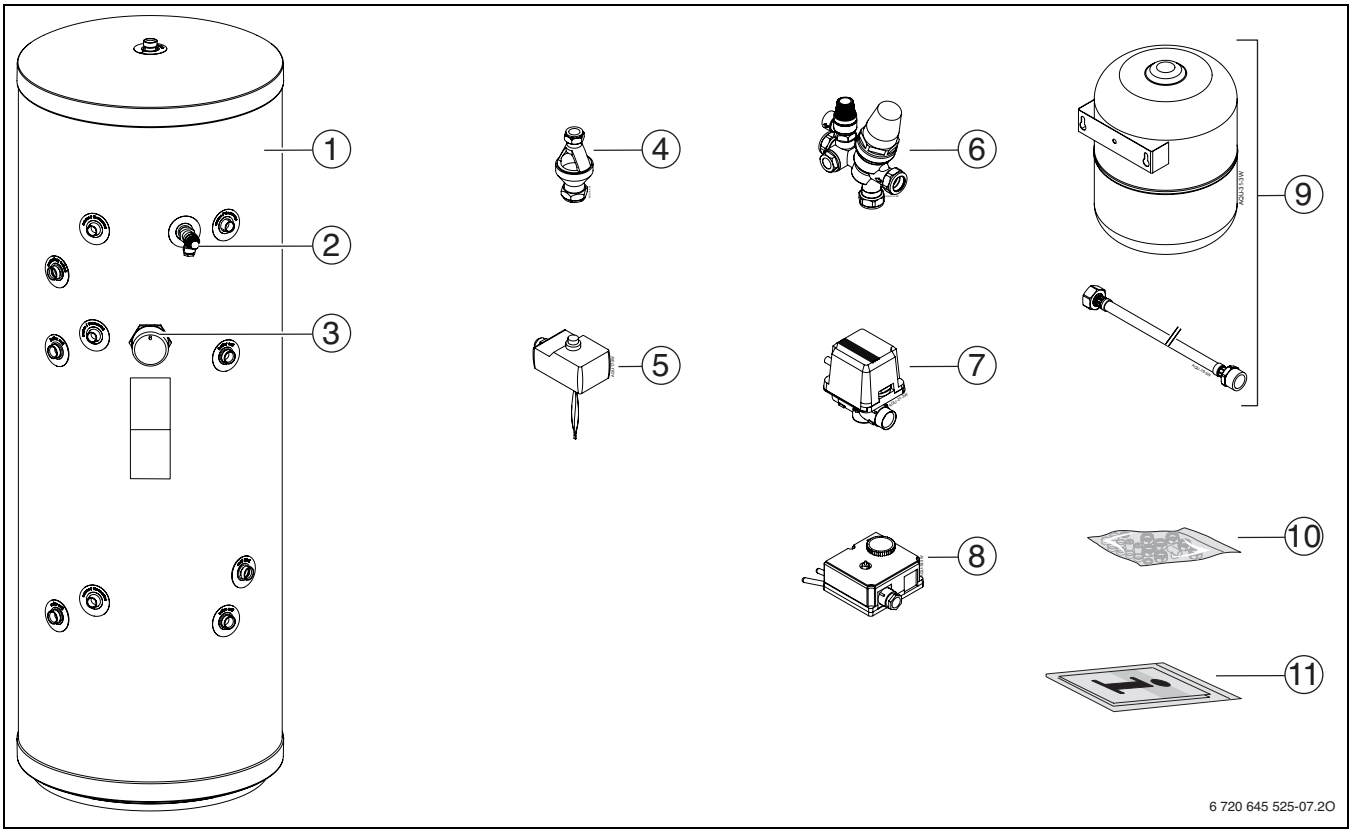

Fig. 1

[1] Twin Coil DHW cylinder
[2] Temperature and pressure relief valve
[3] Immersion heater, 3 kW
[4] Tundish Ø 15/22 mm
[5] Solar high limit thermostat
[6] Cold water Inlet control group
[7] 2-Port valve
[8] Dual cylinder thermostat
[9] DHW expansion vessel incorporating fixing bracket with connection hose
[10] Connection set
[11] Set of printed documents for the appliance

2.5 SCALING/CORROSION PROTECTION

The cylinder is made from corrosion-resistant Duplex stainless steel.

The cylinder can be used with all mains water supplies.

Scaling: In cases where the water hardness is very high (over 450 ppm) a water softener must be used to protect the cylinder against rapid development of scale.

Corrosion protection: Any water softener should be installed, commissioned and maintained to ensure the water hardness after the softener is never below 150 ppm.

2.6 DESCRIPTION OF FUNCTION

- If there is insufficient heat input available via the primary (lower) coil, the secondary heating appliance will heat the upper coil.
- Due to temperature stratification only the upper section of the cylinder will be heated.
- When hot water is being drawn off, the cylinder temperature in the upper section drops by approximately 8 °C to 10 °C before the heat source reheats the cylinder.

2.7 PHYSICAL AND CONNECTION DIMENSIONS

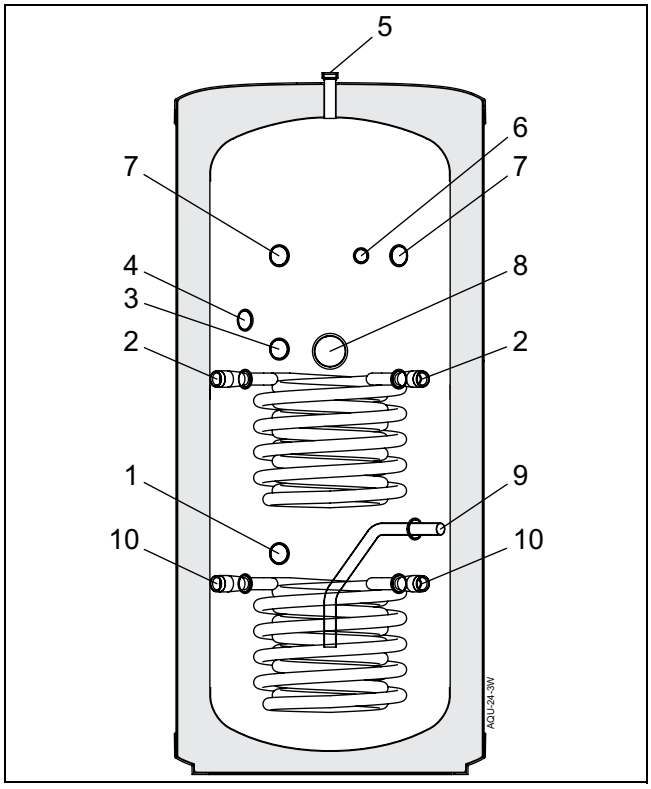

Fig. 2 Overview of connections

[1] Sensor pocket, bottom (internal Ø 20.4 mm)
[2] Cylinder flow / return - secondary appliance (Ø 22 mm)
[3] Sensor pocket, centre (internal Ø 20.4 mm)
[4] DHW secondary circulation connection (Ø 22 mm)
[5] DHW outlet (Ø 22 mm)
[6] Temperature and Pressure Relief valve (1/2")
[7] Sensor pockets, top (x2, internal Ø 20.4 mm)
[8] Immersion heater (Rp 1¾ female)
[9] Cold water inlet (Ø 22 mm)
[10] Cylinder flow / return - primary appliance/solar (Ø 22 mm)

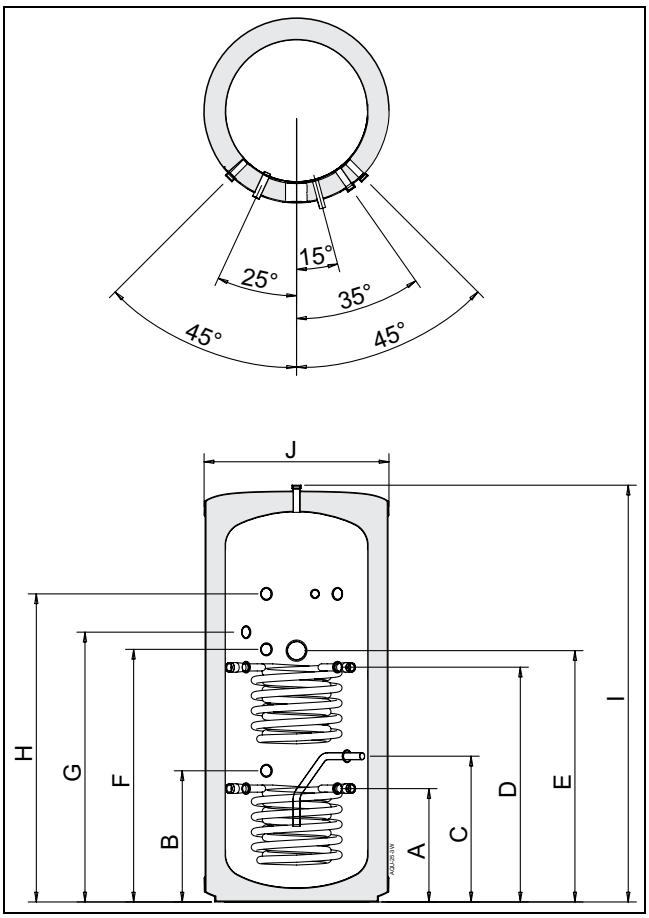

Fig. 3 Physical and connection dimensions

Cylinder	Customer order part numbers	A/mm	B/mm	C/mm	D/mm	E/mm	F/mm	G/mm	H/mm	I/mm	J/mm
TC-150	7 716 800 542	349.5	404.5	449.5	724	775	779	832	950	1285	570
TC-180	7 716 800 543	349.5	404.5	449.5	724	775	779	1032	1150	1490	570
TC-210	7 716 800 544	424.5	479.5	524.5	1028	1079	1083	1207	1325	1665	570
TC-250	7 716 800 545	424.5	479.5	524.5	1112	1163	1167	1407	1525	1860	570
TC-300	7 716 800 546	424.5	479.5	524.5	1112	1163	1167	1707	1825	2155	570

Table 3

CLEARANCE DIMENSIONS

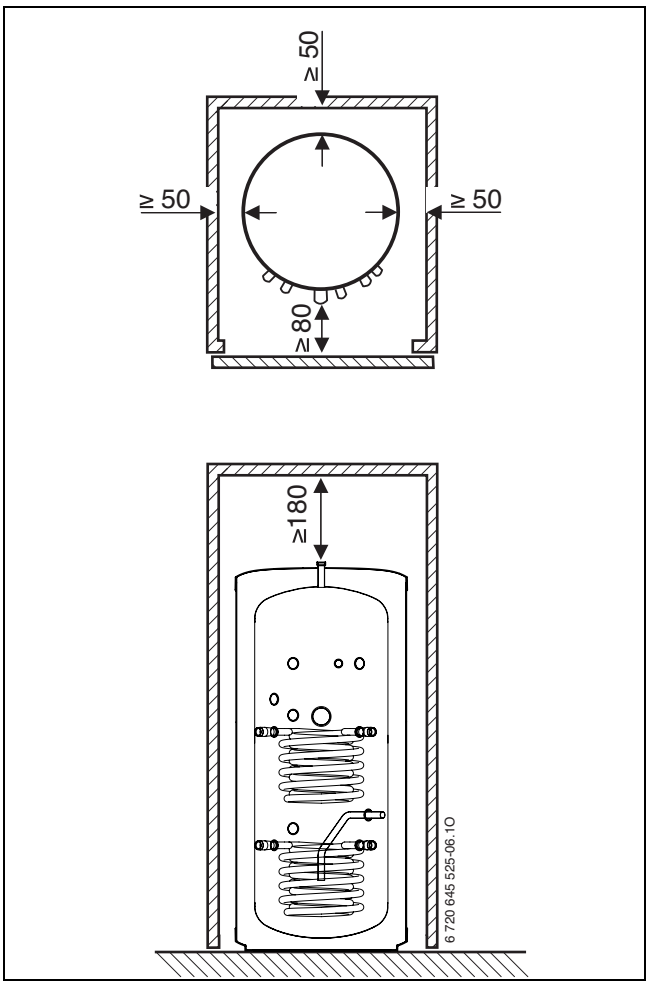

Fig. 4 Recommended minimum wall clearances

2.8 SPECIFICATION

Cylinder type Greenstore		TC-150	TC-180	TC-210	TC-250	TC-300
WRAS No.		1105064	1105064	1105064	1105064	1105064
WRc No.		ETC 15811	ETC 15811	ETC 15811	ETC 15811	ETC 15811
General characteristics						
Dual thermostat setting	°C	10/70	10/70	10/70	10/70	10/70
Dual thermostat high limit	°C	85	85	85	85	85
Temperature and Pressure relief valve	°C	90	90	90	90	90
Temperature and Pressure relief valve	bar	7	7	7	7	7
Maximum operating pressure	bar	5.5	5.5	5.5	5.5	5.5
Minimum operating cold mains pressure	bar	1.5	1.5	1.5	1.5	1.5
Expansion valve setting	bar	6	6	6	6	6
Size of expansion vessel supplied	l	18	18	18	25	25
Expansion vessel charge pressure	bar	3	3	3	3	3
Weight (dry, excl. packaging)	kg	35.6	38.1	44.6	48.9	53.0
Packaged weight	kg	50	53	60	65	69
Weight full of water	kg	200	231	264	298	348
Standby heat loss (24 h)	kWh/d	1.27	1.31	1.42	1.52	1.93
Cylinder capacity:						
Available capacity						
- total	l	158	187	211	241	287
- excl. solar heating	l	93	122	106	126	172
Dedicated solar volume	l	65	65	105	115	115
Upper indirect coil (secondary heat source)						
Heating water content	l	3.0	3.0	4.1	4.1	4.1
Heat exchanger surface	m^2	0.657	0.657	0.845	0.845	0.845
Maximum heating water temperature	°C	120	120	120	120	120
Maximum operating pressure inside the upper indirect coil	bar	6	6	6	6	6
Heat exchanger power (80-60 °C / 10-40 °C)	kW	31.9	31.9	39.4	39.4	39.4
Heat-up time 100% (15-60 °C)	min	14	17	12	13	24
Primary flow rate	l/h	1375	1375	1698	1698	1698
Pressure drop	mbar	150	150	300	300	300
Lower indirect coil (primary heat source/solar)						
Heating water content	l	3.0	3.0	4.1	4.1	4.1
Heat exchanger surface	m^2	0.657	0.657	0.845	0.845	0.845
Maximum solar fluid temperature	°C	130	130	130	130	130
Maximum operating pressure inside the lower indirect coil	bar	6	6	6	6	6
Heat exchanger power (80-60 °C / 10-40 °C)	kW	31.9	31.9	39.4	39.4	39.4
Primary flow rate	l/h	1375	1375	1698	1698	1698
Pressure drop	mbar	150	150	300	300	300
Immersion heater (BS225) (EN60335-2.73)						
Electrical power supply		230 V - 50 Hz	230 V - 50 Hz	230 V - 50 Hz	230 V - 50 Hz	230 V - 50 Hz
Maximum current drawn	A	13	13	13	13	13
Electrical power	W	3000	3000	3000	3000	3000
Minimum breaking capacity	A	13	13	13	13	13
Protection index	IP	21	21	21	21	21
Volume heated by immersion heater	l	59.5	89.7	70.2	87.7	133.9
Heat up time to 65°C	min	80	124	86	138	180

Table 4

CONSTANT DHW OUTPUT

The constant DHW output shown in the specification refers to the following:

- Flow temperature 85 °C
- Outlet temperature 45 °C
- Cold water inlet temperature 10 °C
- Maximum heat input (heat source input at least the same as the cylinder coil output)

Reducing the specified heat input will result in a reduction in the constant DHW output and the performance factor (N_L).

PRESSURE DROP, INTERNAL INDIRECT COIL (IN BAR)

When calculating the pressure drop in the solar circuit:
- ▶ Take the influence of the antifreeze used and the manufacturer's details into account.

Example:
With a water/propylene-glycol mixture of 55/45 (frost protection down to approximately − 30 °C), the pressure drop is approximately 1.3 times the value for tap water.

Pressure drop values resulting from the mains are not taken into account in the diagram.

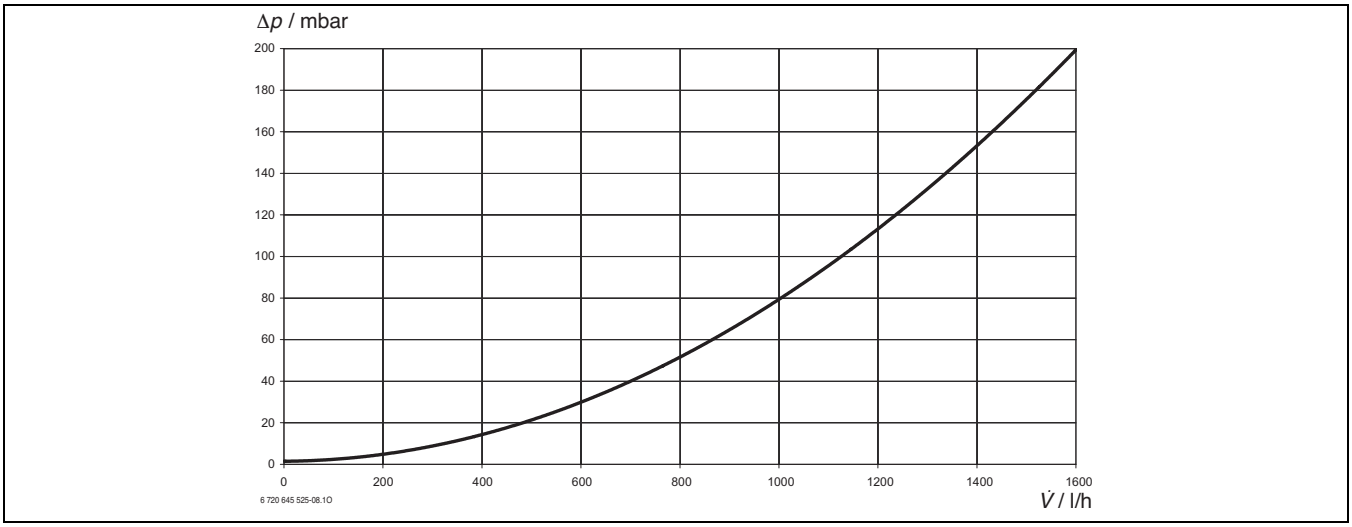

Fig. 5 TC-150 and TC-180

Δp Pressure drop
V̇ Heating water volume

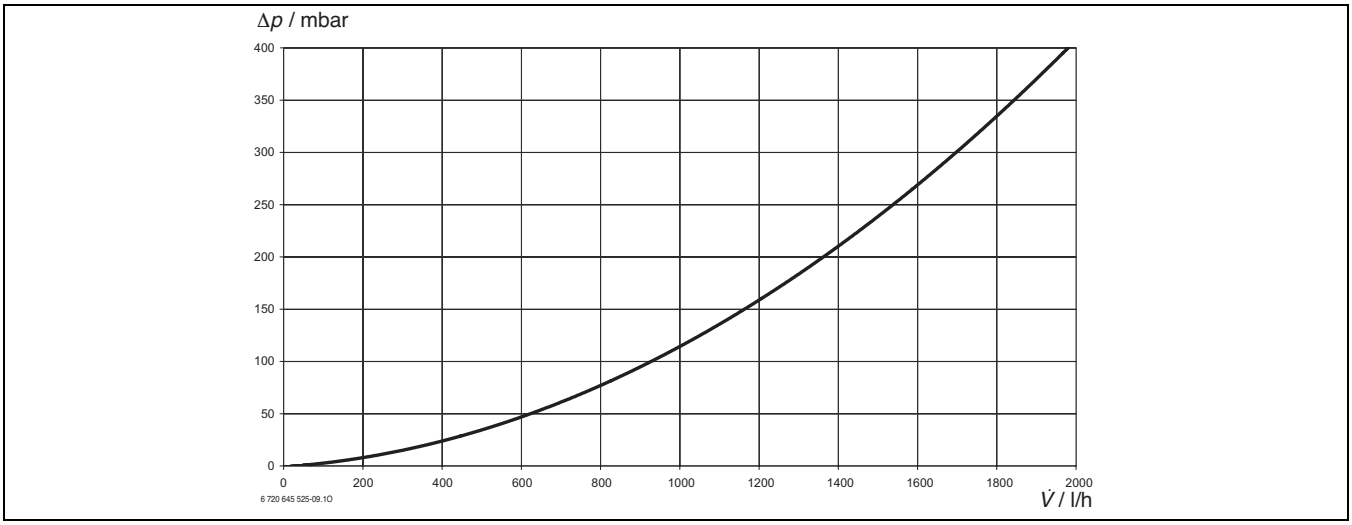

Fig. 6 TC-210, TC-250 and TC-300

Δp Pressure drop
V̇ Heating water volume

3 INSTALLATION

3.1 REGULATIONS

This System has been approved to the Building Regulations for unvented hot water storage systems and the Local Authority must be notified of the intention to install. Therefore the installation must be carried out by a person competent to install unvented hot water systems.

The installation must be carried out in accordance with the following recommendations:

- All current Building Regulations issued by the Department of the Environment, i.e. Approved Document L1 Building Standards (Scotland) (Consolidation) Regulations issued by the Scottish Development Department UK Water Regulations/Byelaws (Scotland)
- Health & Safety Document No. 635 (The Electricity At Work Regulations 1989)

The installation should also be in accordance with the following British Standard Codes of Practice:

- BS 5449:1990 Forced circulation hot water systems
- BS 5546:2000 Installation of hot water supplies for domestic purposes
- BS 5918:1989 Solar heating systems for domestic hot water
- BS 6700:2006 Design, installation, testing and maintenance of services supplying water

Failure to install this appliance correctly could lead to prosecution and will invalidate the guarantee. It is in your own interest and that of safety to ensure that the law is complied with.

Manufacturer's instructions must NOT be taken in anyway as over-riding statutory obligations.

This appliance meets the requirements of IPX4D, i.e. degree of protection against moisture.

Reference should be made to Criteria for gas fired combination boilers used as after heaters in solar thermal systems and BRE Solar heating UK:1981.

3.2 HANDLING

- ▶ Never set the cylinder down hard during handling.
- ▶ Only remove the cylinder from the packaging at the installation location.

3.3 INSTALLATION LOCATION

CAUTION: Damage through stress cracks.

- ▶ Install the cylinder in a room that is free from the risk of frost.

- ▶ Maintain the minimum clearances (→ Fig. 4 on page 7).
- ▶ Install the cylinder on a level floor with sufficient load-bearing capacity.
- ▶ If installing the cylinder in wet rooms, position it on a suitable platform.

3.4 SOLAR CONNECTION DIAGRAM

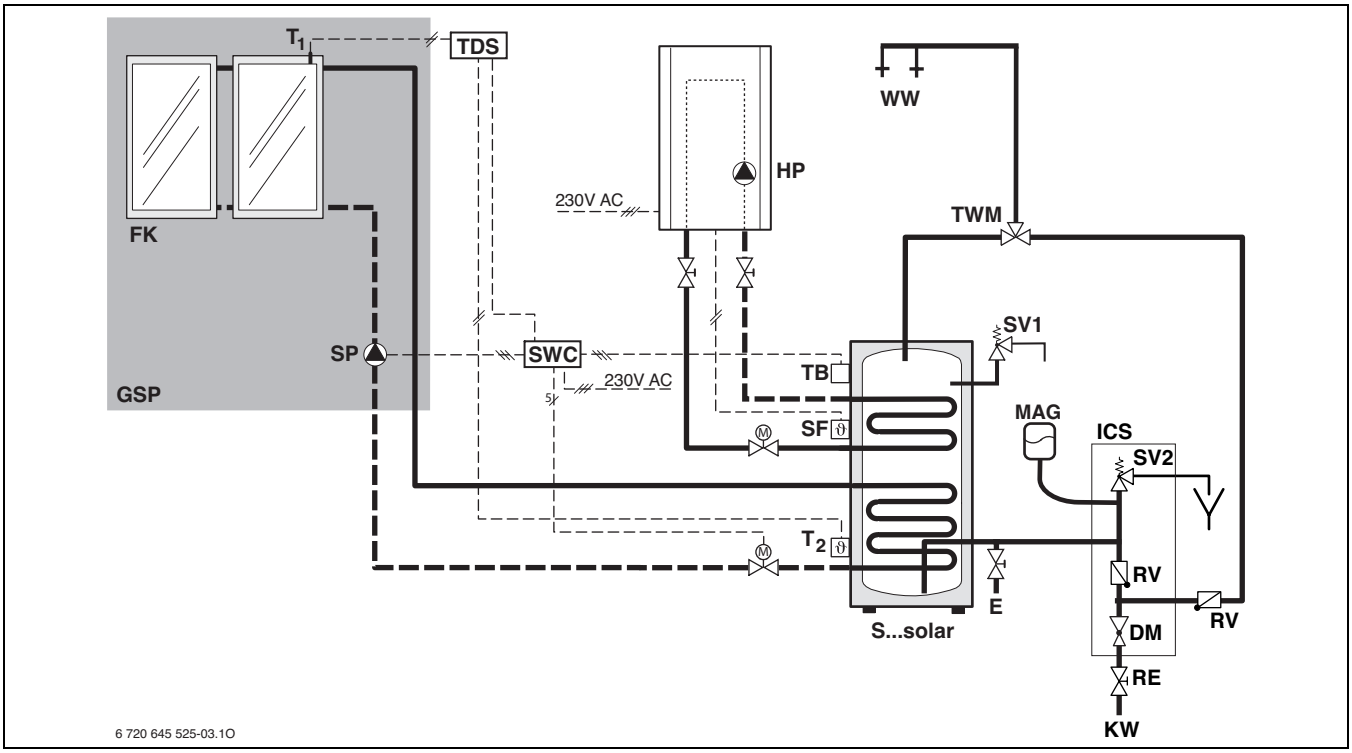

Fig. 7

DM	Pressure reducing valve (G3 kit supplied)
E	Drain valve
FK	Solar collector (optional accessory)
GSP	Greenskies solar package (optional accessory)
HP	Circulation pump (heating circuit/cylinder heating)
ICS	Inlet control set
KW	Cold water inlet
MAG	Expansion vessel (G3 kit supplied)
RE	Isolating valve
RV	Non-return valve
SF	Cylinder temperature sensor - secondary heat source
SP	Solar circuit pump (optional accessory)
SV1	Temperature and Pressure relief valve
SV2	Expansion relief valve (G3 kit supplied)
SWC	Terminal box
S...solar	Twin coil cylinder
TB	Solar system high limit thermostat (G3 kit supplied)
T_1	Temperature sensor, solar collector (optional accessory)
T_2	Cylinder temperature sensor - solar
TDS	Solar controller (optional accessory)
TWM	Thermostatic DHW mixer (optional accessory)
WW	DHW connection

3.5 INSTALLING THE TEMPERATURE SENSORS

The temperature sensors and safety equipment are fitted in different locations on the cylinder, subject to system.

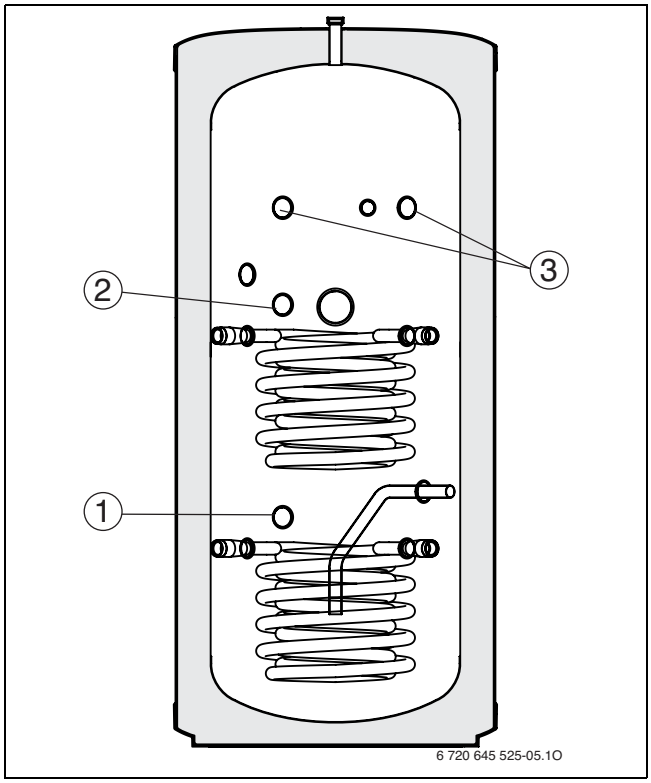

Fig. 8 Overview of connections

[1] Lower sensor pocket
[2] Centre sensor pocket
[3] Upper sensor pocket

Solar thermal system?	**yes**	**yes**	**no**	**no**
System type	**S-plan or Y-plan**	**with internal three-way valve**	**S-plan or Y-plan**	**with internal three-way valve**
Upper sensor pocket 1	Solar high limit thermostat	Solar high limit thermostat and 2nd solar sensor [1)]	–	–
Upper sensor pocket 2	2nd solar sensor[1)]	Dual cylinder thermostat [2)]	–	Dual cylinder thermostat[2)]
Centre sensor pocket	Dual cylinder thermostat	Cylinder temperature sensor [3)]	Dual cylinder thermostat	Cylinder temperature sensor[3)]
Lower sensor pocket	Solar sensor 1	Solar sensor 1	–	–

Table 5

1) 2nd solar sensor is required for some solar installations

2) Only the temperature limiter will be connected

3) Part of the standard delivery of the internal three-way valve (heating appliance accessory)

3.6 INSTALLATION

All hydraulic cylinder connections are suitable for 22 mm pipes.

- ▶ Make connections with the compression fittings supplied.

3.6.1 CONNECTION OF THE SECONDARY APPLIANCE

- ▶ Connect to the upper coil (→ fig. 2 [2], page 6) using the compression fittings supplied, either connection can be flow or return, performance is identical either way. The heating circuit must be positively pumped as gravity circulation is not possible.
- ▶ The heating circuit can be open vent or sealed system to a maximum pressure of 6 bar. If the heating circuit is sealed an expansion vessel, pressure gauge and pressure relief valve will be required if not already part of the heating appliance.
- ▶ The heating appliance may be gas, oil or electric but must be under effective thermostatic control. Uncontrolled heat sources such as some AGAs, back boilers and solid fuel stoves are not suitable.
- ▶ Caution must be taken to prevent an air lock at time of commissioning the unit, an air vent may be required.
- ▶ The coil must be able to be drained via a suitable valve.

3.6.2 CONNECTION OF THE PRIMARY APPLIANCE OR SOLAR SYSTEM

- ▶ Connect to the lower coil (→ fig. 2 [10], page 6) using the compression fittings supplied, either connection can be flow or return, performance is identical either way. The heating/solar circuit must be positively pumped as gravity circulation is not possible.
- ▶ The heating/solar circuit can be open vent or sealed system to a maximum pressure of 6 bar. If the heating/solar circuit is sealed an expansion vessel, pressure gauge and pressure relief valve will be required if not already part of the heating appliance or solar system equipment.
- ▶ The heating appliance may be gas, oil or electric but must be under effective thermostatic control. Uncontrolled heat sources such as some AGAs, back boilers and solid fuel stoves are not suitable.
- ▶ A solar system must be provided with a suitable controller and means of thermostatic control with the solar sensors being fitted as per TAB. 5, page 12, of this manual and the control manufacturer's instructions.

In solar installations the mixing ratio of glycol & water may increase the pressure drop through the coil.

- ▶ Caution must be taken to prevent an air lock at time of commissioning the unit, an air vent may be required.
- ▶ The coil must be able to be drained via a suitable valve.

3.6.3 CONNECTION ON THE WATER SIDE

- ▶ Install the cold water inlet control group with the compression fittings supplied. The mains supply must be able to provide the minimum pressure and flow rates stated in specification table TAB. 4, page 8.
- ▶ The cold water inlet control group includes a 6 bar expansion relief valve. A discharge pipe must be installed and routed via a tundish in accordance with current regulations.

NOTICE:

- ▶ When draining either the domestic hot water system or the cylinder ensure the cold water supply is isolated and that at least two hot water draw off points are opened. One of these hot water draw off points **must be the one closest to the cylinder in height terms**. The drain valve installed at the cold water supply inlet to the cylinder should be used, where practicable.

CAUTION: Damage through excess pressure.

- ▶ Never restrict the outlets of any safety valves.

- ▶ Install a drain valve at the cold water inlet.

3.6.4 DHW SECONDARY CIRCULATION

Cylinders are equipped with a DHW secondary return connection.

- ▶ If no DHW secondary circulation is required, blank off and ensure a water tight seal (→ fig. 2 [4], page 6).
  Seal and insulate the connection.
- ▶ When connecting DHW secondary circulation:
  Install a DHW circulation pump approved for potable water and a suitable non-return valve.

Due to the possibility of heat losses, DHW secondary circulation is only recommended in conjunction with a DHW secondary circulation pump that is time or temperature-controlled. The circulation circuit must be properly insulated.

To ensure safe DHW outlet temperatures thermostatic mixing valves may be required. Guidance must be taken from current regulations.

THERMAL DISINFECTION

Guidance must be taken from current regulations to ensure the risk of Legionella bacteria growth is prevented.

3.6.5 DHW EXPANSION VESSEL

▶ Connect the expansion vessel using the hose supplied to the cold water inlet control group.

For DHW systems with a large volume:

▶ Check whether the expansion vessel supplied (18 or 25 litres) is adequate and if required, install an additional expansion vessel in parallel to the one supplied, ensuring the air charge of each is identical.

3.6.6 INSTALLING THE DISCHARGE PIPE WORK FROM THE SAFETY VALVES SUPPLED

WARNING: Risk of scalding!
Hot water can lead to severe scalding.

▶ Route the discharge pipe work so that any discharged hot water or steam cannot create a risk.

▶ Locate the cold water inlet control group so that any water flowing from the expansion relief valve will be drained together with any water discharged from the temperature and pressure relief valve.

▶ Route the discharge pipework in accordance with part G3, schedule 1 of the Building Regulations (the following includes the most important requirements of the Building Regulations).

▶ Install the tundish vertically in direct proximity to the cylinder (maximum distance between safety valves and tundish 600 mm).

▶ The discharge pipe work must be of a material capable of withstanding the potential temperatures and pressures.

▶ The following applies for the discharge pipe work downstream of the tundish:
- Minimum 300 mm vertical drop before the first bend.
- Must be at least one pipe size larger than the inlet of the tundish.
- Route the discharge pipe work with a constant fall.

3.6.7 DISCHARGE ARRANGEMENT

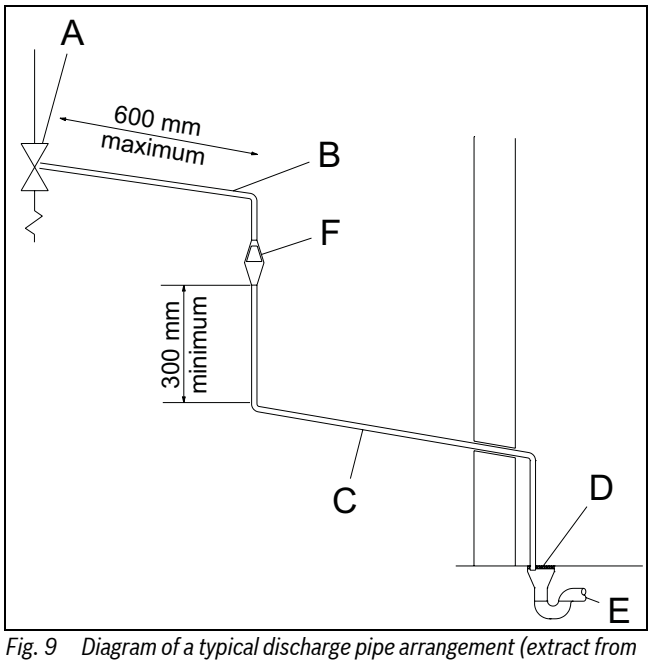

Fig. 9 Diagram of a typical discharge pipe arrangement (extract from Building Regulation G3)

A Safety device (e.g. temperature relief valve)
B Metal discharge pipe (D1) from temperature relief valve to tundish
C Discharge pipe (D2) from tundish with continuous fall
D Fixed grating
E Trapped gulley
F Tundish

Position the inlet control group so that the discharge from both the two safety valves can be joined together via a 15 mm end feed Tee. Connect the Tundish and route the discharge pipe. The discharge pipework must be routed in accordance with Part G3 of schedule 1 of the Building Regulations. The information that follows is not exhaustive and if you are in doubt you should seek advice.

The two safety valves will only discharge water under fault conditions. When operating normally water will not be discharged.

The tundish should be vertical, located in the same space as the unvented hot water storage system and be fitted as close as possible and within 600 mm of the safety device e.g. the temperature relief valve.

The discharge pipe (D2) from the tundish should terminate in a safe place where there is no risk to persons in the vicinity of the discharge and:

- Be at least one pipe size larger than the nominal outlet size of the safety device unless its total equivalent hydraulic resistance exceeds that of a straight pipe 9 m long i.e. discharge pipes between 9 m and 18 m equivalent resistance length should be at least two sizes larger than the the nominal outlet size of the safety device, between 18 and 27 m at least 3 sizes larger, and so on. Bends must be taken into account in calculating the flow resistance. Refer to Fig. 9, Table 6 and the worked example.
  An alternative approach for sizing discharge pipes would be to follow BS6700 Specification for design installation, testing and maintenance of services supplying water for domestic use within buildings and their curtilages.
- Have a vertical section of pipe at least 300 mm long, below the tundish before any elbows or bends in the pipework.
- Be installed with a continuous fall.
- It is preferable for the discharge to be visible at both the tundish and the final point of discharge but where this is not possible or practically difficult there should be clear visibility at one or other of these locations. Examples of acceptable discharge arrangements are:
  - Ideally below the fixed grating and above the water seal in a trapped gulley.
  - Downward discharges at a low level; i.e. up to 100 mm above external surfaces such as car parks, hard standing, grassed areas etc. are acceptable providing that where children play or otherwise come into contact with discharges, a wire cage or similar guard is positioned to prevent contact whilst maintaining visibility.
  - Discharges at a high level; e.g. in to metal hopper and metal down pipe with the end of the discharge pipe clearly visible (tundish visible or not) or onto a roof capable of withstanding high temperature discharges of water and 3 m from any plastic guttering systems that would collect such discharges (tundish available).
  - Where a single pipe serves a number of discharges, such as in blocks of flats, the number served should be limited to not more than 6 systems so that any installation can be traced reasonably easily. The single common discharge pipe should be at least one pipe size larger than the largest individual discharge pipe to be connected. If unvented hot water storage systems are installed where discharges from safety devices may not be apparent i.e. in dwellings occupied by blind, infirm or disabled people, consideration should be given to the installation of an electronically operated device to warn when discharge takes place.

▶ The discharge will consist of scalding water and steam. Asphalt, roofing felt and non-metallic rainwater goods may be damaged by such discharges.

▶ It is not acceptable to discharge straight into a soil pipe.

The table below is based on copper tube. Plastic pipes may be of different bore and resistance. Sizes and maximum lengths of plastic should be calculated using data prepared for the type of pipe being used.

Valve outlet size	Minimum size of discharge pipe D1[1)]	Minimum size of discharge pipe D2[1)] from tundish	Maximum resistance allowed, expressed as a length of straight pipe (i. e. no elbows or bends)	Resistance created by each elbow or bend
G1/2	15 mm	22 mm	up to 9 m	0.8 m
		28 mm	up to 18 m	1.0 m
		35 mm	up to 27 m	1.4 m
G3/4	22 mm	28 mm	up to 9 m	1.0 m
		35 mm	up to 18 m	1.4 m
		42 mm	up to 27 m	1.7 m
G1	28 mm	35 mm	up to 9 m	1.4 m
		42 mm	up to 18 m	1.7 m
		54 mm	up to 27 m	2.3 m

Table 6 Sizing of copper discharge pipe "D2" for common temperature relief valve outlet sizes

1) see Fig. 9

WORKED EXAMPLE:

The example below is for a G1/2 temperature relief valve with a discharge pipe (D2) having 4 No. 22 mm elbows and length of 7 m from the tundish to the point of discharge.

From Table 6:
Maximum resistance allowed for a straight length of 22 mm copper discharge pipe (D2) from a G1/2 temperature relief valve is: 9.0 m

Subtract the resistance for 4 No. 22 mm elbows at 0.8 m each = 3.2 m

Therefore the maximum permitted length equates to 5.8 m which, is less than the actual length of 7 m therefore calculate the next largest size.

Maximum resistance allowed for a straight length of 28 mm copper discharge pipe (D2) from a G1/2 temperature relief valve is: 18 m

Subtract the resistance for 4 No. 28 mm elbows at 1.0 m each = 4 m

Therefore the maximum permitted length equates to: 14 m

As the actual length is 7 m, a 28 mm (D2) copper pipe will be satisfactory.

3.7 ELECTRICAL CONNECTIONS

DANGER: Risk of electric shock!

- Before making any electrical connections, disconnect the power supply (230 V AC) to the heating system.
- Make sure all terminal screws are properly tightened before commissioning especially on immersion heater line.

CONNECTING THE INDIRECT CONTROLS

The indirect thermal controls should be wired into a suitable indirect control system to ensure optimum control of the cylinder and boiler. All electrical work must conform to current IEE Wiring Regulation (BS 3456).

For more in depth wiring instructions and diagrams reference must be made to the appropriate manufacturers installation instructions for the products installed along side this unit.

Products must be wired to meet all current regulations with regards to G3.

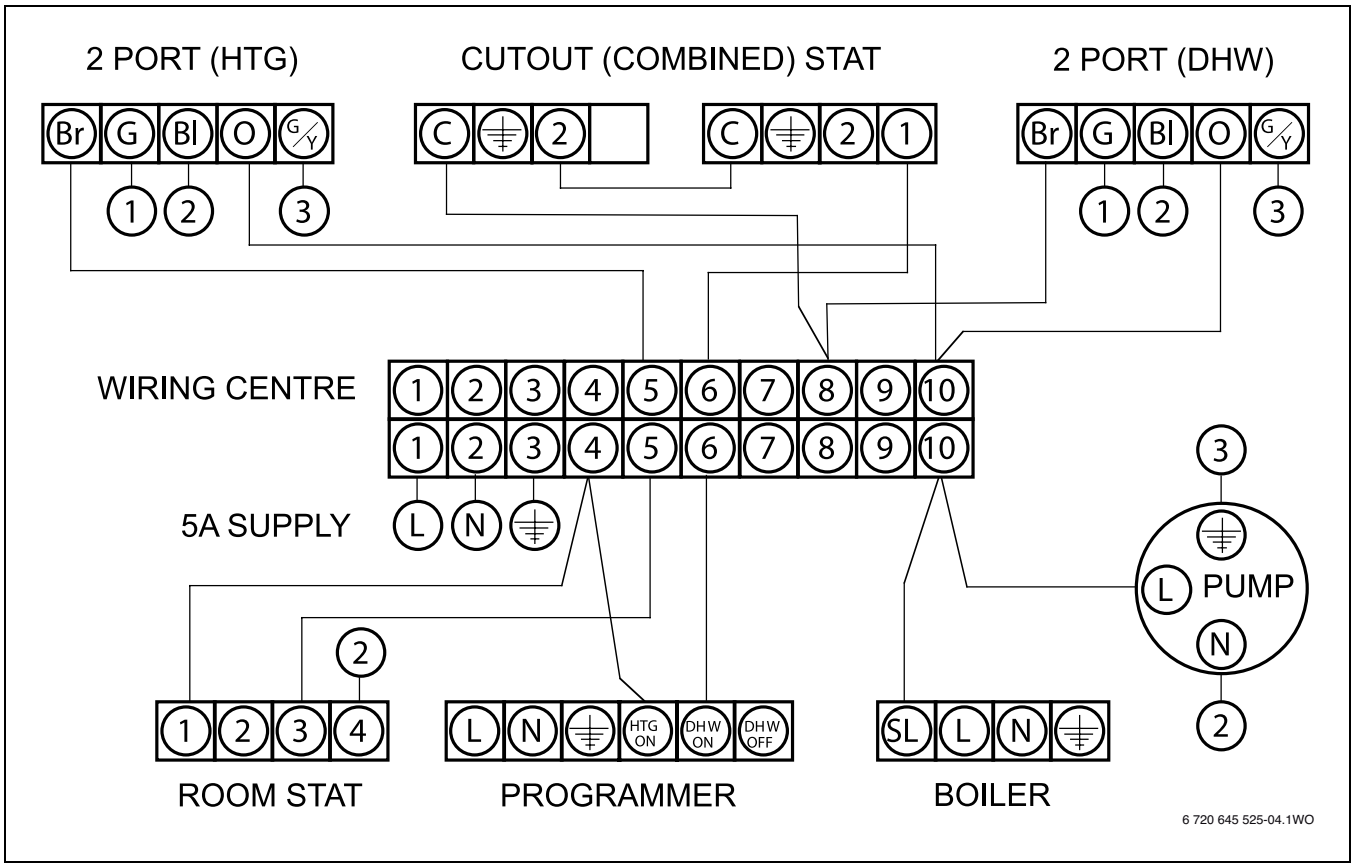

Fig. 10 Variant dual thermostat wiring: wiring diagram 2 port zone valve (S-plan)

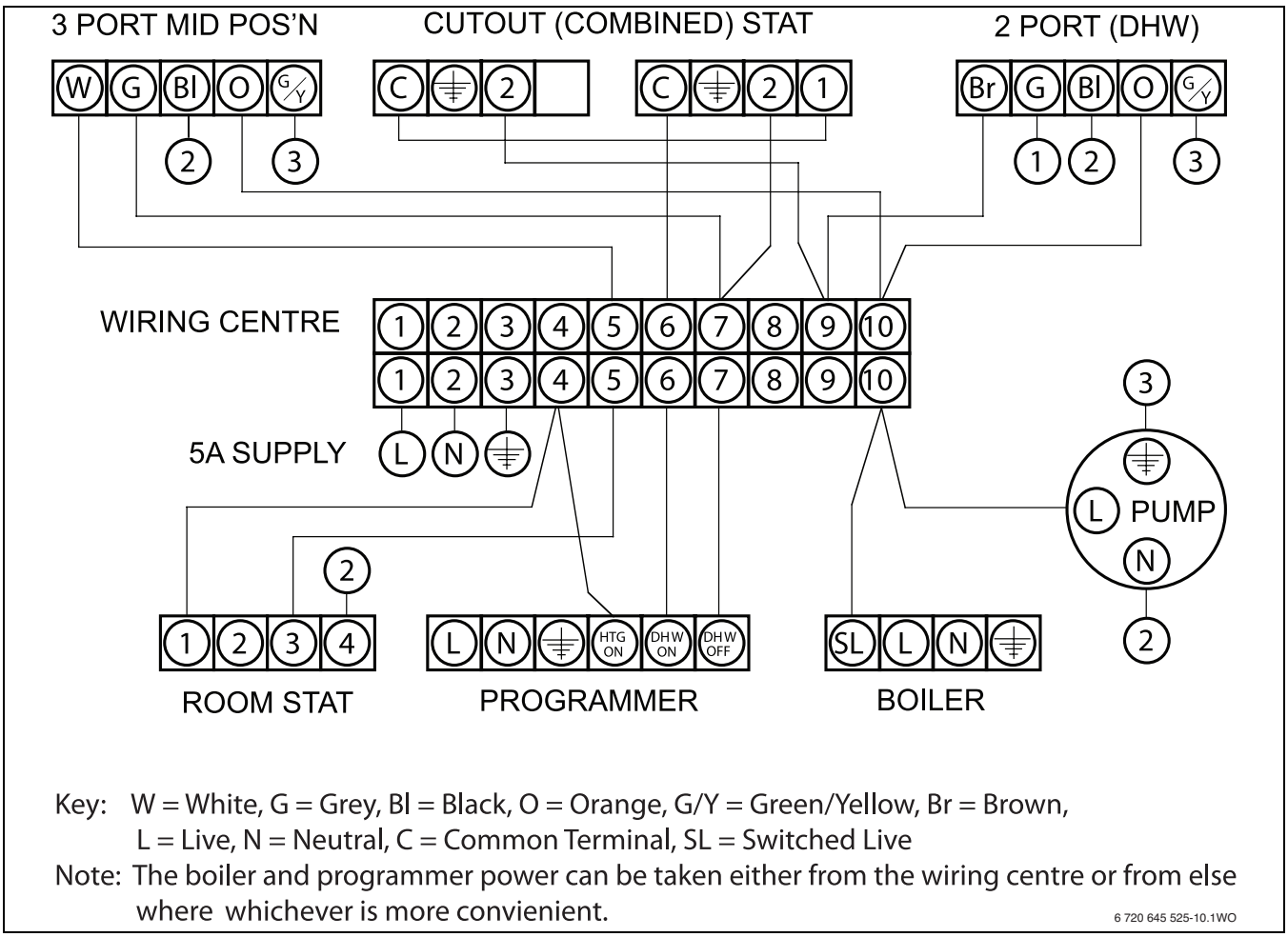
3 PORT MID POS'N
CUTOUT (COMBINED) STAT
2 PORT (DHW)
W G Bl O G/Y
C 2
C 2 1
Br G Bl O G/Y
WIRING CENTRE
1 2 3 4 5 6 7 8 9 10
5A SUPPLY
L N
PUMP
1 2 3 4
L N HTG ON DHW ON DHW OFF
SL L N
ROOM STAT
PROGRAMMER
BOILER
Key: W = White, G = Grey, Bl = Black, O = Orange, G/Y = Green/Yellow, Br = Brown,
L = Live, N = Neutral, C = Common Terminal, SL = Switched Live
Note: The boiler and programmer power can be taken either from the wiring centre or from else where whichever is more convienient.
6 720 645 525-10.1WO

Fig. 11 Variant dual thermostat wiring: wiring diagram 3 port mid position valve (Y-plan) + 2 port valve

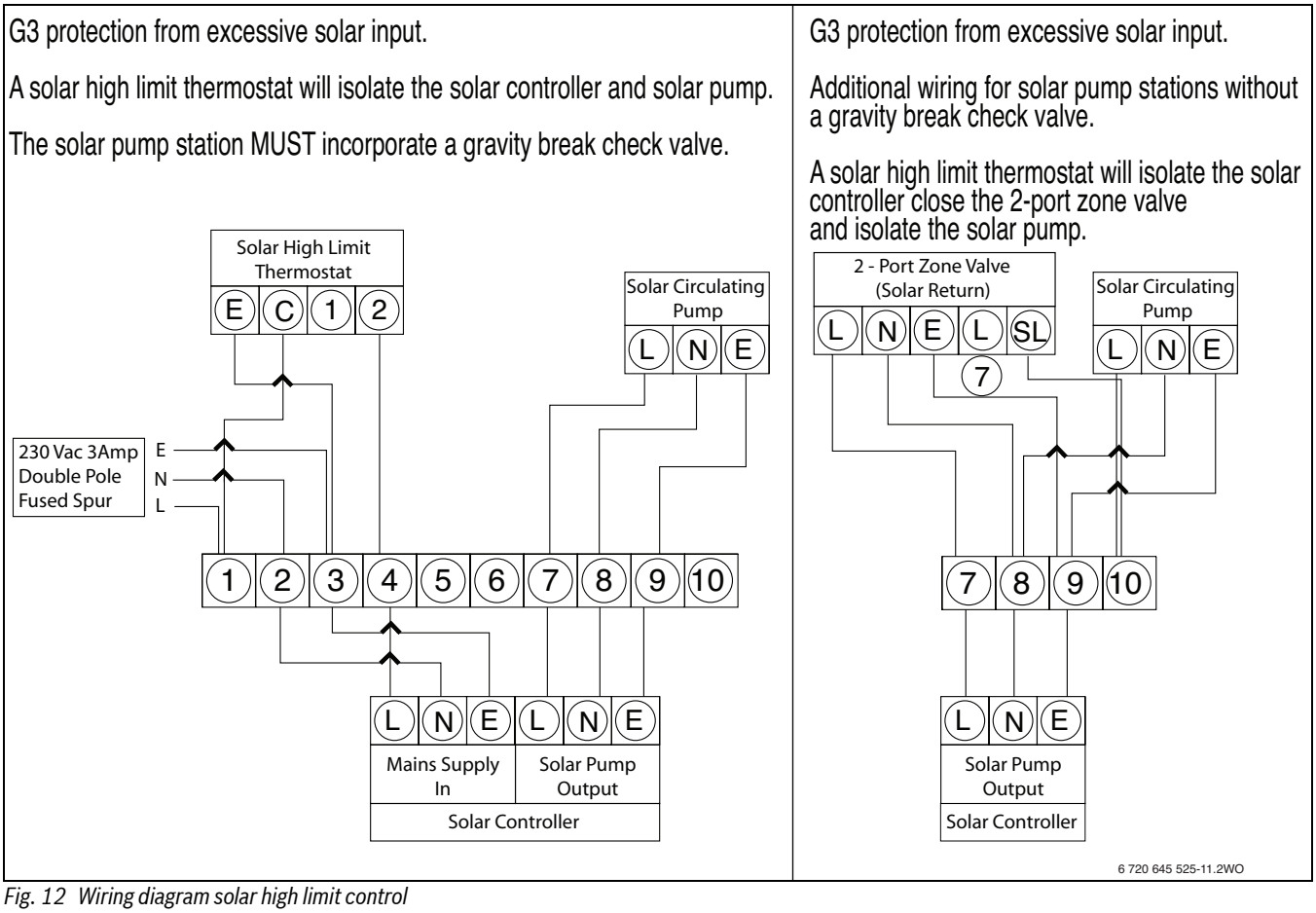
G3 protection from excessive solar input.
A solar high limit thermostat will isolate the solar controller and solar pump.
The solar pump station MUST incorporate a gravity break check valve.
Solar High Limit Thermostat
E C 1 2
Solar Circulating Pump
L N E
230 Vac 3Amp Double Pole Fused Spur
E N L
1 2 3 4 5 6 7 8 9 10
L N E L N E
Mains Supply In
Solar Pump Output
Solar Controller
G3 protection from excessive solar input.
Additional wiring for solar pump stations without a gravity break check valve.
A solar high limit thermostat will isolate the solar controller close the 2-port zone valve and isolate the solar pump.
2 - Port Zone Valve (Solar Return)
L N E L SL
7
Solar Circulating Pump
L N E
7 8 9 10
L N E
Solar Pump Output
Solar Controller
6 720 645 525-11.2WO

Fig. 12 Wiring diagram solar high limit control

CONNECTING THE IMMERSION HEATER (HEATERS CONFORM TO EN60335.2.73)

- ▶ Ensure the mains voltage corresponds to the voltage rating of the heater as shown on the rating label on the terminal cover.
- ▶ Only use rigid wires 1.5 mm^2 for main supply. Flexible wire may cause poor electrical connection to the heater, resulting in overheat.
- ▶ When connecting the thermostat please ensure the male pins are securely located within the female sockets.
- ▶ Accessories (washers, cable grip, screws...) delivered in the plastic bag under the terminal cover of the heater have to be used to complete the connection to the earth and to fix the rigid cable.

It is essential that the water level within the tank or cylinder is such that water fully covers the heating elements to a depth of at least 100 mm. Under no circumstances must the heater be permitted to run dry - serious damage may result to the heater in addition to danger of personal injury & damage to property.

Check the heater for possible leakage before wiring. See below for schematic wiring diagram.

Wire the heater through a double-pole fused spur, having contact separation of at least 3 mm, with a minimum breaking capacity of 13 Amps.

Use a rigid cable, 2 m long max, with 1.5 mm^2 cross-section and a temperature resistance of at least 85°C. Rubber Insulated HOFR Sheathed, complying with BS6141 Table 8. It must be fully earthed. Ensure all terminal connections are securely made. Do not however use excessive force when tightening the terminal screws.

NEMKO Approval will only apply to this heater if the Thermowatt RTS plus thermostat is used.

Immersion heater conforms with EEC Directive 76/889 for Radio Interference and comply with BS800: 1977.

WIRING THE IMMERSION HEATER:

DANGER: Risk of electric shock!
- ▶ Isolate from mains supply.

- ▶ Remove the terminal cover from the immersion heater. Use the accessories supplied in the plastic bag located under the cover of the immersion heater to complete the wiring.

- ▶ This heater must be earthed.

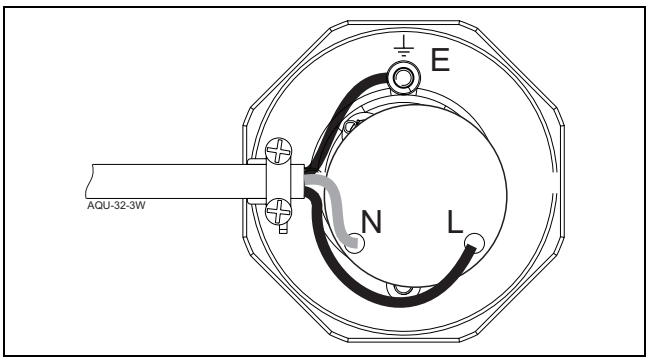

Fig. 13 Wiring diagram

E Earth (Green/Yellow)
N Neutral (Blue)
L Live (Brown)

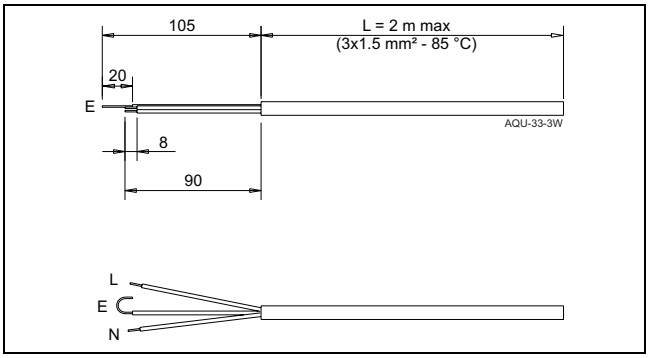

Fig. 14 Rigid cable end preparation

E Earth (Green/Yellow)
N Neutral (Blue)
L Live (Brown)

- ▶ Provide 90 mm length for the Live (L) and Neutral (N) cables and bare the end of each cable 8 mm minimum.
- ▶ Provide 105 mm length for the Earth cable (E) and bare the end of the cable 20 mm minimum. Make a circle with the end of the Earth cable (E) to turn around the earth stud (1) to ensure a full contact between the cup washer (6) and the plain washer (4) (refer to the fitment of earth cable to stud).
- ▶ Fit the Live and Neutral cables on the thermostat.

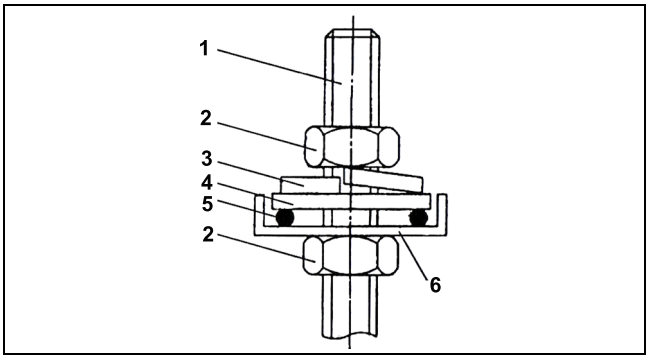

Fig. 15 Fitment of earth cable to stud

[1] Earth stud
[2] Nuts (x2) *
[3] Shake-proof washer *
[4] Plain washer *
[5] Earth cable
[6] Cup washer *
[*] supplied in the plastic bag

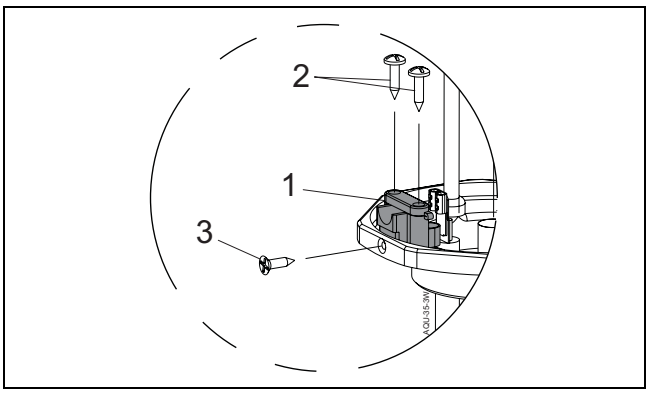

Fig. 16 Cable grip assembly

[1] Cable grip moulding *
[2] Pan head screws (x 2) *
[3] Head posi-drive screw *
[*] supplied in the plastic bag

- ▶ Fit two pan head screws into cable clamp on grip and secure with self tapping screw in the location hole in brass head of the immersion heater.

4 COMMISSIONING

4.1 USER INFORMATION FROM THE SYSTEM INSTALLER

Explain to the customer how the boiler and the cylinder work and how to operate them.

- ▶ Advise the user regarding the need for regular maintenance, on which function and service life depend.
- ▶ When there is a risk of frost and the cylinder is taken out of use, drain the cylinder completely, including its lower section.
- ▶ Give the user all documentation.
- ▶ This appliance must only be operated by a responsible adult who has been instructed in, understands, and is aware of the appliance's operating conditions and effects.

4.2 PREPARING FOR USE

4.2.1 GENERAL

Only a competent person must commission the system.

- ▶ Commission the heating appliance and solar thermal system in accordance with manufacturer's instructions or the appropriate installation and operating instructions.

4.2.2 FILLING THE CYLINDER

Prior to filling the cylinder:

- ▶ Check the pre-charge pressure of the expansion vessel (3 bar); top-up if required.
- ▶ Flush the pipework as well as the cylinder with tap water.
- ▶ Fill the cylinder whilst a DHW draw-off point is fully open, until water flows steadily from it.
- ▶ Check all connections and the immersion heater fitting for tightness.

4.3 SETTING THE CYLINDER TEMPERATURE

- ▶ Set the required cylinder temperature at the cylinder thermostat.

-or-, on heating appliances with internal three-way valve,

- ▶ Set the required cylinder temperature in accordance with the operating instructions of the heating appliance.

WARNING: Risk of scalding!

- ▶ In normal operation, do not set the temperature higher than 60 °C.

5 SHUTTING DOWN

NOTICE:

- ▶ When draining either the domestic hot water system or the cylinder ensure the cold water supply is isolated and that at least two hot water draw off points are opened. One of these hot water draw off points **must be the one closest to the cylinder in height terms**. The drain valve installed at the cold water supply inlet to the cylinder should be used, where practicable.

5.1 TAKING THE CYLINDER OUT OF USE

- ▶ Disable DHW heating in accordance with the operating instructions of the heating appliance (frost protection).
- ▶ Shut down the solar thermal system if fitted, in accordance with the operating instructions of the solar controller.
- ▶ When there is a risk of frost and the cylinder is taken out of use, drain the cylinder completely, including its lower section.

6 ENVIRONMENTAL PROTECTION/DISPOSAL

Environmental protection is one of the fundamental company policies of the Bosch Group.
Quality of performance, efficiency and environmental protection are equally important objectives for us. Laws and requirements aimed at protecting the environment are strictly adhered to.
To protect the environment we will, subject to economical aspects, use the best possible technology and materials.

The cylinder heat loss has been minimised due to a good thermal insulation.

To keep a high efficiency load to the system all water connecting pipes to the cylinder must also be properly insulated.

PACKAGING

Where packaging is concerned, we participate in country-specific recycling processes that ensure optimum recycling.
All packaging materials are environmentally compatible and can be recycled.

USED APPLIANCES

Old appliances contain materials that should be recycled.
The relevant assemblies are easy to separate, and all plastics are identified. This allows the various assemblies to be appropriately sorted for recycling or disposal.

7 INSPECTION/MAINTENANCE

7.1 RECOMMENDATIONS FOR USERS

▶ Arrange a maintenance and inspection contract with a competent person. Have the heating appliance and the DHW cylinder serviced annually.

CAUTION: A safety valve malfunction can result in excessive pressure levels.
▶ Check the function of the expansion relief valve in the cold water inlet control group and the temperature and pressure relief valve, and flush several times by cracking them open.

7.2 MAINTENANCE AND REPAIR

DANGER: Risk of electric shock!
▶ Ensure all electrical supplies are isolated before carrying out any maintenance on the cylinder.

▶ Only use genuine spare parts!

7.2.1 DRAINING

NOTICE:
▶ When draining either the domestic hot water system or the cylinder ensure the cold water supply is isolated and that at least two hot water draw off points are opened. One of these hot water draw off points **must be the one closest to the cylinder in height terms**. The drain valve installed at the cold water supply inlet to the cylinder should be used, where practicable.

▶ Isolate the cylinder from the power supply and drain it before carrying out cleaning or repair steps.
▶ If required, drain the internal indirect coil. If required, blow out the lower coils.

7.2.2 DESCALING / CLEANING

IN HARD WATER AREAS

The level of scale build-up depends on the time in use, the operating temperature and the water hardness. Scaled-up internal indirect coils reduce the water content, lower the heat-up output, increase the energy consumption and extend the heat-up time.

▶ Subject to the level of scaling, descale the cylinder regularly.

When water hardness is over 450 ppm water treatement has to be considered (or annual service with descaling)

IN SOFT WATER AREAS

▶ Check the inside of the cylinder regularly and clean out any sludge.

7.2.3 IMMERSION HEATER

If the thermal cut-out operates contact a competent installer to investigate and identify the cause of the fault. If the fault re-occurs after this investigation the immersion heater will need to be replaced.

When refitting an immersion heater, ensure the O-ring is positioned correctly on the head of the immersion heater and lubricate before fitting. Fit it by hand until almost home then tighten gently as the O-rings will seal easily.

7.2.4 RE-COMMISSIONING

▶ Flush the cylinder thoroughly after cleaning or repair.
▶ Vent the heating, solar and DHW sides.

8 SPARE PARTS LIST

TT no.	Designation
8-716-113-407-0	High flow rate inlet control set (pressure reducing valve, strainer and expansion relief valve)
8-716-113-408-0	Temperature and pressure relief valve 7 bar
8-716-113-409-0	Tundish
8-716-113-410-0	2 port valve
8-716-113-411-0	Dual thermostat
8-716-113-412-0	Immersion heater (same on all models)
8-716-113-416-0	18 litre expansion vessel (150, 180 & 210 sizes)
8-716-113-418-0	25 litre expansion vessel (250 & 300 litre size)
8-716-113-414-0	Expansion vessel hose (3/4" M x 3/4" F)
8-716-113-522-0	Solar high limit thermostat
8-716-842-371-0	Connection set
8-716-841-952-0	Expansion relief valve 6 bar
8-716-841-951-0	Self-contained cartridge

Table 7

9 THE GUARANTEE

The Greenstore stainless steel cylinder carries a fully transferable 25 year guarantee against faulty material or manufacture subject to Terms & Conditions. To read the full Terms & Conditions please visit us online at www.worcester-bosch.co.uk/guarantee. The Guarantee Registration form is available on this same page and can be completed and submitted electronically. Alternatively please telephone one of our Guarantee Registration advisors on 0844 892 2552. Your statutory rights are not affected by the manufacturers guarantee.

MAINS PRESSURE HOT WATER STORAGE SYSTEM COMMISSIONING CHECKLIST

This Commissioning Checklist is to be completed in full by the competent person who commissioned the storage system as a means of demonstrating compliance with the appropriate Building Regulations and then handed to the customer to keep for future reference.

Failure to install and commission this equipment to the manufacturer's instructions may invalidate the warranty but does not affect statutory rights.

Customer Name _____ Telephone Number _____

Address _____

Cylinder Make and Model _____

Cylinder Serial Number | | |

Service Record

It is recommended that your heating system is serviced regularly and that the appropriate Service Interval Record is completed.

Service Provider

Before completing the appropriate Service Record below, please ensure you have carried out the service as described in the manufacturer's instructions.

Always use the manufacturer's specified spare part when replacing controls.

Service 1 Date:

Engineer Name:

Company Name:

Telephone No.

Gas Safe Register No.

Comments:

Signature:

Service 2 Date:

Engineer Name:

Company Name:

Telephone No.

Gas Safe Register No.

Comments:

Signature:

Service 3 Date:

Engineer Name:

Company Name:

Telephone No.

Gas Safe Register No.

Comments:

Signature:

Service 4 Date:

Engineer Name:

Company Name:

Telephone No.

Gas Safe Register No.

Comments:

Signature:

Service 5 Date:

Engineer Name:

Company Name:

Telephone No.

Gas Safe Register No.

Comments:

Signature:

Service 6 Date:

Engineer Name:

Company Name:

Telephone No.

Operative ID No.

Comments:

Signature:

Service 7 Date:

Engineer Name:

Company Name:

Telephone No.

Gas Safe Register No.

Comments:

Signature:

Service 8 Date:

Engineer Name:

Company Name:

Telephone No.

Gas Safe Register No.

Comments:

Signature:

Service 9 Date:

Engineer Name:

Company Name:

Telephone No.

Gas Safe Register No.

Comments:

Signature:

Service 10 Date:

Engineer Name:

Company Name:

Telephone No.

Gas Safe Register No.

Comments:

Signature:

WORCESTER, BOSCH GROUP:

TECHNICAL SUPPORT:	0844 892 3366
APPOINTMENTS:	0844 892 3000
SPARES:	01905 752571
LITERATURE:	0844 892 9800
TRAINING:	01905 752526
SALES:	01905 752640

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